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Original Article

Prevalence and associated factors of chronic venous insufficiency among seafood processing workers in Hai Phong, Vietnam

Chi Tran Thi Quynh[1,2], Tam Nguyen Van[2,1], Duc Nguyen Hoang Viet[1], Van Le Thi[1], Hai Do Thi[2,1]

[1]Vietnam National Institute of Maritime Medicine, 21 Vo Nguyen Giap, Kenh Duong, Le Chan, Hai Phong, Vietnam
[2]Hai Phong University of Medicine and Pharmacy, 72A Nguyen Binh Khiem, Dang Giang, Ngo Quyen, Hai Phong, Vietnam

Corresponding author:
Tam Nguyen Van, MD. PhD
Hai Phong University of Medicine and Pharmacy, 72A Nguyen Binh Khiem, Dang Giang, Ngo Quyen, Hai Phong, Viet Nam
E-mail: nvtam@hpmu.edu.vn
ORCID: https://orcid.org/0009-0003-7776-7023

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ABSTRACT

Introduction: Chronic venous insufficiency (CVI) is a condition of impaired venous system function due to insufficiency of venous valves. The prolonged periods of standing or sitting are considered the most crucial risk factor of CVI. The objective of this study is to determine the prevalence and associated factors of CVI among seafood processing workers.

Methods: A cross-sectional descriptive was conducted through clinical examination and face-to-face interviews with 1,160 seafood processing workers in Hai Phong from March to November 2023 to determine the prevalence and associated factors of CVI.

Results: The prevalence of CVI was 51.9%; the prevalent symptom was restless legs (54.0%); nocturnal cramps (49.3%); tight feeling in calves (43.2%); pins and needles (36.4%); edema lower legs (28.6%). Of all participants 4.1% were C0 (no signs of varicose veins were seen), 82.9% were C1 (there are telangiectasias or reticular veins), 11.0% were C2 (varicose vein) and 2.0% were C3 (edema). Factors associated with CVI: female (OR = 2.51, p = 0.002); age group 30 – 39; 40 – 49 and ≥ 50 (OR = 4.99, 12.82 and 13.11, p = 0.001) compared with under 30 years old; prolonged periods of standing or sitting (OR = 2.08, p = 0.001); overweight and obesity (OR = 1.82, p = 0.037); abdominal obesity (OR = 2.11, p = 0.025); diabetes (OR = 1.95, p = 0.045); hypertension (OR = 2.59, p = 0.004); gave birth to 2 and 3 children (OR = 1.78 and 2.35, p = 0.002); working time over 8 hours per day (OR = 3.87, p <0.001).

Conclusion: CVI is a disease with a high incidence in seafood processing workers. On average, 1 of 2 workers have varicose veins. To prevent CVI, it is crucial to recommend workers exercise between shifts or breaks, and have regular health check-ups to detect symptoms and signs of CVI.

Keywords: Associated factors, chronic venous insufficiency (CVI), seafood processing workers, Vietnam.

Introduction

Chronic venous insufficiency (CVI) describes impaired lower limb venous function due to insufficiency of venous valves in the superficial and deep venous system, which may or may not be accompanied by venous thromboembolism.[1,2] This condition leads to a decline in the return of blood to the heart by the venous system in the leg. Blood stagnation will cause hemodynamic changes and deformation of surrounding tissue, causing symptoms, such as pain, heavy feeling in legs, edema in lower limbs, burning, tingling, and nocturnal leg cramps, which can lead to some complications such as eczema, non-healing leg ulcers, bleeding, dilated superficial veins, superficial vein phlebitis, deep vein thrombosis.[1,3,4]

CVI was not the majority cause of death but is a cause of reduced quality of life and indirectly causes death when the complication of pulmonary embolism occurs. CVI had a high incidence in the community: the percentage of adults diagnosed with varicose veins was from 9% to 40%.[5–8] This condition tended to increase in subjects: women, obesity, family history of CVI, and people with occupations that require standing for long periods, such as sales, textiles, seafood processing, and teaching.[9–12]

The figure for people having CVI varied between countries, research subjects, occupations and age groups. A study was conducted in some communities, including Brazilian, Czech Republic, French, Hungarian, Italian, Romanian, Russian and Spanish populations. The results showed that 22% of research subjects had signs of CVI.[6] According to research by Kirsten N et al. on 19,104 workers in Germany, 80.2% of which working in an office, the percentage of those diagnosed with CVI was 21.1%.[7] Another study on teachers in Abha, Saudi Arabia showed that 42.0% of teachers had CVI.[13]

In Vietnam, most workers in the seafood processing sector are manual workers. Although the amount of work in this field is not too heavy, their working posture often requires them to stand for long periods, requiring high labor intensity and concentration; the working environment has a high humidity; working hours usually last over 8 hours per day. This is a favorable condition leading to CVI and affects the health of workers.

Methods

The study was conducted among 1,160 seafood processing workers with working experience of over two years from three seafood processing companies in Hai Phong (Halong canned food joint stock corporation; Nam Trieu Cooperative; Viet Truong limited liability company) from March to November 2023.

Those workers who refuse to engage in the study; those with edema, ulcers in legs, or having the same symptoms and signs of CVI but are caused by other diseases, such as thrombophlebitis of the lower extremities, diabetic leg ulcers, swelling legs due to heart failure or kidney failure were excluded from the study.

The sample size was calculated based on the following formula:

$n = Z^2_{(1-a/2)} \times p(1-p)/d^2$; in there: n is the minimum sample size, Z is the level of confidence (for a level of confidence of 95%, Z= 1.96); p: the estimated prevalence of CVI, p = 0.5 (because there has been no similar study on seafood processing workers); d is the acceptable error level, d = 0.03; Substituting into the above formula, the minimum sample size was calculate i.e. 1,067 participants. In reality, the symptoms and signs of CVI for 1,160 seafood processing workers were examined. A list of workers from three seafood processing companies was made. Next, select the sample by using a simple random number table to select 1,160 people from the list randomly.

Blood pressure, height, weight, waist, and hip circumference of participants were measured and clinical examination was conducted to detect the symptoms and signs of CVI.

Face-to-face interviews were done among study participants to determine associated factors of CVI such as gender, marital status, age of life, working experience, education, working posture, maternity history, and working hours per day.

Fasting Plasma Glucose test: Fasting venous blood samples were taken in the morning (far away from the meal for at least 8 hours), and was conducted at the Laboratory of Biochemistry - Institute of Marine Medicine by Beckman Coulter's AU 480 automatic biochemistry analyzer based on electroluminescence principle.

Doppler ultrasound of lower extremity veins assesses the status of venous valves, saphenous vein diameter and venous thrombosis for all study participants.

CVI diagnosis: According to the European Society for Vascular Surgery.[14] Symptoms: Tired, heavy legs, aching legs, edema in lower legs and ankles, burning, tingling and itching in legs, nocturnal

cramps. These symptoms will be exacerbated by prolonged standing or sitting and reduce when patients put their legs up high or rest. Signs: Visible veins dilated, serpentine, changes in skin, eczema, ulcers and the appearance of hemangiomas (from class C1 to C6).

CVI's classification according to Clinical Etiological Anatomical Psychophysiology (CEAP).[15] C0: No signs of varicose veins (sight or palpation) were seen; C1: There are telangiectasias or reticular veins; C2: Varicose vein; C3: Oedema; C4: Nutritional disorders of venous origin: Skin pigmentation disorders, venous eczema....C5: Nutritional disorders such as C4+: healed ulcers; C6: Ulcers do not heal scars.

Assessment of diabetes according to ADA 2021 (American Diabetes Association).[16] In our study, diabetes was diagnosed when fasting plasma glucose ≥ 7.0 mmol/l or HbA1c ≥ 6.5% or had been diagnosed and treated for diabetes before.

Assessment of hypertension according to the criteria of the World Hypertension Society 2020 (ISH 2020).[17]Hypertension was defined as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg or being treated with antihypertensive drugs.

Assessment of overweight and obesity based on BMI (body mass index), which is calculated by the formula: weight (kg)/height (m^2); according to World Health Organization (WHO) standards for adults in Asia: being overweight, obesity when BMI > 23kg/m^2.[18]

Assessment of abdominal obesity based on Waist/hip ratio (WHR: Waist Hip Ratio): According to WHO applied to the Asia-Pacific region: abdominal obesity is defined as a waist/hip ratio ≥ 0.90 for males and ≥ 0.85 for females.[19]

The study data were processed by biomedical statistical methods based on SPSS for Windows 22.0 software. Categorical variables were represented using frequencies and percentages (%), and continuous variables were summarized with mean and standard deviation (SD). Multivariate logistic regression analyses were employed to compute odds ratios (ORs) along with their corresponding 95% confidence intervals (CIs) to explore the associations between CVI risk factors among seafood processing workers. Statistical significance when p value was < 0.05. Identification of risk factors was carried out through multivariate logistic regression analysis, employing a binary dependent variable denoting CVI status. The variables included in the model as potential risk factors comprised gender, age group, education level, working experience, working posture, overweight, obesity, abdominal obesity, hypertension, diabetes, maternity history, and working hours.

This study was approved by the Ethics Committee in Biomedical Research of the Institute of Marine Medicine, according to decision 05/2023/QĐ-YHB. Participation in the study by all the seafood processing workers was consent and completely voluntary.

Results

Researching 1,160 seafood processing workers, through clinical examination to detect symptoms and signs of CVI in combination with Doppler ultrasound of lower extremity veins, and interviewing research subjects, we obtained the following results:

The majority of study participants were female comprising 69.4% and the age range among workers was 19 to 60 years old: Of which, age 50 or above was 38.3%; 40 – 49 years old (36.9%); 30 – 39 years old (21.0%); under 30 years old (3.8%). The working experience of research subjects spanned from 2 to 37 years: with 50.3% working for more than 20 years, while 19.8% had a working duration of 10 to 19 years and 29.9% had less than under 10 years. More than two-thirds (69.2%) of participants had completed high school while 18.4% graduated from college and those who finished studying elementary, and secondary school made up the lowest proportion (12.4%) (Table 1).

Table 1: Characteristics of study subjects (n = 1160)

Characteristics		No. (%)
Gender	Male	355 (30.6)
	Female	805 (69.4)
Age (years)	mean (SD); min – max	45.5 ± 8.5; 19 – 60
	<30	44 (3.8)
	30 – 39	244 (21.0)
	40 – 49	429 (36.9)
	≥ 50	443 (38.3)
Working experience (years)	mean (SD); min – max	16.3 ± 9.9; 2 - 37
	<10	347 (29.9)
	10-19	230 (19.8)
	≥ 20	583 (50.3)
Education	Elementary, Secondary school	144 (12.4)
	High school	803 (69.2)
	College	213 (18.4)

Note: SD = standard deviation; No =Number

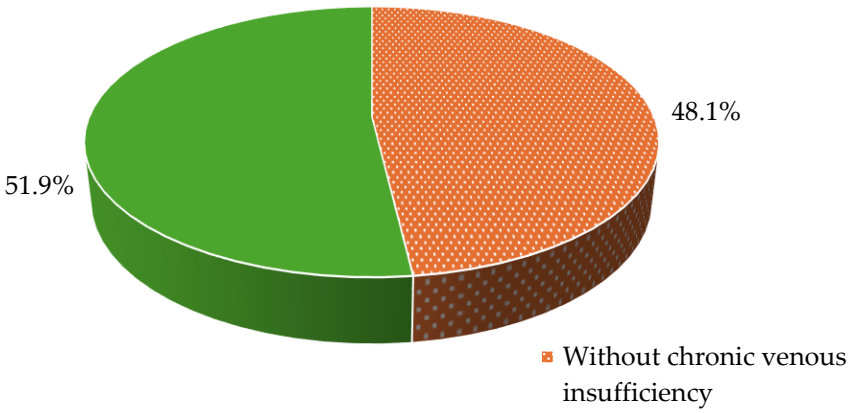

Figure 1: Prevalence of CVI among seafood processing workers (n = 1160)

The prevalence of seafood processing workers with Chronic venous insufficiency was 51.9%. (Figure 1).

Prevalent symptoms in workers with CVI showed that - the most prevalent symptoms of workers in CVI were burning, and tingling in legs (54.0%); followed by Nocturnal cramps (49.3%); Achy, heavy feeling (43.2%); "Pins and needles" sensation (36.4%); Edema legs (28.6%); no symptoms (27.4%) (Table 2).

Table 2: Prevalent symptoms in workers with CVI (n = 602)

Symptoms	No. (%)
No symptoms	165 (27.4)
Achy, heaviness feeling	260 (43.2)
Nocturnal cramps	297 (49.3)
Burning, tingling in legs	325 (54.0)
Edema legs	172 (28.6)
"Pins and needles" sensation	219 (36.4)

Classification of CVI among seafood processing workers: 82.9% of workers with CVI were categorized at C1; 11.0% of those were at C2; 2.0% was C3; 4.1% was C0. There were no workers with CVI classified from C4 to C6 (Table 3).

Table 3: Classification of CVI of seafood processing workers by gender

CEAP	Male	Female	Total
	No. (%)	No. (%)	No. (%)
C0	7 (6.1)	18 (3.7)	25 (4.1)
C1	97 (84.4)	402 (82.5)	499 (82.9)
C2	9 (7.8)	57 (11.7)	66 (11.0)
C3	2 (1.7)	10 (2.1)	12 (2.0)
Total	115 (100.0)	487 (100.0)	602 (100.0)

Multivariate logistic regression analysis of factors associated with CVI of seafood processing workers (Table 4): The percentage of female workers at risk of CVI was 2.51 times as high as compared to male workers (95% CI: 1.89 - 4.16; p = 0.02). Workers in the age group of 30 – 39; 40 – 49 and ≥ 50 at risk of CVI were 4.99; 12.82 and 13.11 times as high as those under 30 years old (p < 0.001). Workers who had 10 to 19 years and more than 20 years of work experience were 1.67 times and 2.97 times more vulnerable to CVI than those with less than 10 years of work experience. Seafood processing workers who had to stand or sit continuously for long periods were 2.08 times and 1.63 times more prone to CVI than those standing and sitting at the same time (p = 0.043 and 0.001). Those who were overweight and obese were 1.82 times more vulnerable to CVI than those who were not (95%CI: 1.11 - 3.65; p = 0.037). Similarly, the proportion of workers who had abdominal obesity was 2.11 times more at risk of CVI than those who were not (95%CI: 1.46 - 4.88; p=0.025). Workers with hypertension and diabetes were 2.59 times and 1.59 times more prone to CVI than those without them (p = 0.004 and 0.045). Female workers with 2 and 3 children were 1.78 times and 2.35 times more at risk of CVI than those without children (p = 0.032 and 0.002). Workers who worked over 8 hours per day were 3.87 times more vulnerable to CVI than those working 8 hours per day (95%CI: 2.14-6.99; p <0.001).

Table 4: Multivariate logistic regression analysis of factors associated with CVI of seafood processing workers

Variable	n	CVI n (%)	Without CVI n (%)	AOR (95%CI)	p-value
Gender					
Female	805	487 (60.5)	318 (39.5)	2.51 (1.89 - 4.16)	0.002
Male	355	115 (32.4)	240 (67.6)		
Education level					
High school	803	410 (51.1)	393 (48.9)	Reference group	
College	213	114 (53.5)	99 (46.5)	1.04 (0.50 - 1.83)	0.906
Elementary, Secondary school	144	78 (54.2)	66 (45.8)	1.32 (0.78 - 2.01)	0.192

Variable	n	CVI n (%)	Without CVI n (%)	AOR (95%CI)	p-value
Age group (years)					
<30	44	17 (38.6)	27 (61.4)	Reference group	
30 – 39	244	94 (38.5)	150 (61.5)	4.99 (1.26 - 16.31)	0.001
40 – 49	429	224 (52.2)	205 (47.8)	12.82 (3.15 - 33.28)	<0.001
≥ 50	443	267 (60.3)	176 (39.7)	13.11 (3.24 - 3.02)	<0.001
Working experience					
<10	347	119 (34.3)	228 (65.7)	Reference group	
10-19	230	107 (46.5)	123 (53.5)	1.67 (1.09 - 2.53)	0.017
≥ 20	583	376 (64.5)	207 (35.5)	2.97 (1.88 - 4.69)	<0.001
Working posture					
Standing and sitting	217	76 (35.0)	141 (65.0)	Reference group	
Sitting	149	74(49.7)	75(50.3)	1.63 (1.02 - 2.84)	0.043
Standing	794	452(56.9)	342(43.1)	2.08 (1.35 - 3.21)	0.001
Overweight, Obesity					
Yes	399	237(59.4)	162(40.6)	1.82 (1.11 - 3.65)	0.037
No	761	365 (48.0)	396 (52.0)		
Abdominal obesity					
Yes	593	365 (61.6)	228 (38.4)	2.11 (1.46 - 4.88)	0.025
No	567	237 (41.8)	330 (58.2)		
Hypertension					
Yes	111	72 (64.9)	39 (35.1)	2.59 (1.35 - 3.21)	0.004
No	1049	530 (50.5)	519 (49.5)		
Diabetes					
Yes	97	67 (69.1)	30 (30.9)	1.95 (1.08 - 3.91)	0.045
No	1063	535 (50.3)	528 (49.7)		
Maternity history					
0 child	18	67 (48.2)	72 (51.8)	Reference group	
1 child	45	31 (59.6)	21 (40.4)	1.22 (0.87 - 3.14)	0.067
2 children	551	344 (62.4)	207 (37.6)	1.78 (1.13 - 3.41)	0.032
3 children	63	45 (71.4)	18 (28.6)	2.35 (1.42 - 5.15)	0.002
Working hours					
> 8 hours/day	152	104 (68.4)	48 (31.6)	3.87 (2.14 - 6.99)	<0.001
8 hour/day	1008	498 (49.4)	510 (50.6)		

Abbreviation: AOR = Adjusted odds ratio, CI: Confidence Interval

Discussion

Researching 1,160 seafood processing workers, the results showed that the rate of chronic venous insufficiency (CVI) was 51.9%, of which 96.5% of workers had never been diagnosed with CVI. The results of our study were higher than some studies of CVI on different subjects.

The research of Patrick H Carpentier, et al., on 2,000 French individuals showed that the rate of residents with CVI was 40.3%, of which females were 50.5% and men were 30.1%.[9] A cross-sectional study conducted at clinics in Spain on 19,800 patients showed that the percentage of female patients made up the majority (63.0%), the average age was 53.7 ± 20 years old; the rate of those with CVI (CEAP categories C1 - C6) was 48.5%.[20] According to a study by Khan AFA et al. on 3,000 Pakistanis at the age of 18 - 95, 34.8% of individuals were vulnerable to CVI.[8] An observational study collected data from 2006 to 2015 on 19,104 workers in Germany, of which 80.2% worked in offices, showed that the rate of CVI was 21.1%.[7] According to research of Evans CJ, et al., on 1,566 residents in the age group of 18 - 64 in Edinburgh city, the percentages of those who were diagnosed with CVI in men and women were 32% and 40%.[21] The rate of workers with CVI in our study was high in the community in Vietnam. To explain this, we believed that most seafood processing workers worked in a standing position. During the entire work shift, they must constantly stand in one position and rarely move. Standing in one position for a long period creates a huge amount of pressure on the venous system, which can lead to obstruction of blood returning to the heart. This had been explained in the pathogenesis of lower limb venous insufficiency, venous return was influenced by gravity. Living and working posture required prolonged sitting or standing and being sedentary facilitated blood flow to legs, increasing pressure in veins in legs, which caused damage to one - way venous valves. When the valves were weakened, they would reduce their ability to prevent blood from flowing downward due to the effect of gravity, leading to blood stasis in legs and insufficiency of the venous valves.[1,3]

The rate of workers with CVI in our study was lower than that in the research of Zolotukhin IA, et al., on residents over 18 years old in central Russia (69.3%).[12] Research by Kwon S et al. on 1,116 Korean medical staff showed that 247 (21.2%) employees were men and 919 (78.8%) were women, the rate of staff with CVI was 79.6%.[22] Another study on surgical medical staff in Vietnam showed that the rate of CVI was 87.1%.[10]

The most prevalent symptom of seafood processing workers with CVI was burning, and tingling in legs (54.0%), followed by nocturnal cramps (49.3%), Achy, heavy feeling in legs (43.2%); "Pins and needles" sensation (36.4%); edema lower legs (28.6%). Research by Eberhard Rabe, et al., showed that the most prevalent initial symptoms were tiredness, heaviness, achy, edema in legs and nocturnal cramps.[6] Research by Igor Zolotukhin et al. showed that the most prevalent initial symptoms were pain in the legs, heaviness, tiredness, itching and swelling sensation which were recorded in 14.8%, 36.3%, 32.8%, 7.0%, and 29.1% correspondingly. Thus, the feeling of heaviness in the legs was explained by blood stasis in the veins, and the feeling of nocturnal cramps and achy, tiredness in legs was probably due to the inflammatory process in legs and peripheral neuropathy in the pathophysiology of venous insufficiency. However, these symptoms often occurred when workers had to stand for long periods, especially after each shift.

Multivariate logistic regression analysis of factors associated with CVI of seafood processing workers, the result in Table 4 showed that female workers were 2.51 times more vulnerable to CVI than men. Most studies on different subjects about CVI showed that women had a higher risk of CVI than men.[5,8,9,23] To explain this, we believed that it was due to the influence of female hormones (progesterone and estrogen) when they were pregnant obstructed the return of venous flow. During pregnancy, the amount of blood increased, which caused increased venous pressure in the lower extremities. In addition, an increase in

estrogen and progesterone affected the venous system, which led to dilation of the smooth muscles, causing blood stasis in the legs. This made the transport blood of lower limb venous system back to the heart more difficult.[24] Workers having occupational age from 10 – 19 years and more than 20 years were 1.67 times and 2.97 times more vulnerable to CVI than those with less than 10 years of working experience. This result was consistent with the study of Chen CL, et al., on barbers, which that barbers who worked more than 30 years were more prone to CVI (OR = 10.9; 95%CI: 1.6 - 73.8).[25] Therefore, high occupational age meant longevity, most studies in the world insisted that age was one of the risk factors for CVI.[5,8,22]

Seafood processing workers who continuously sit or stand were 1.63 times and 2.08 times more prone to CVI than those who have a combination of standing and sitting. The results of our study were similar to the study of Dang H, et al., showing that working posture was related to chronic venous insufficiency; sitting more than 3.5 hours/day (OR = 2.74; 95%CI: 1.12 – 6.72); standing continuously for more than 1.5 hours (OR = 2.35; 95%CI: 1.01 - 5.45).[10] Chen CL et al studied barbers and showed that those standing to work more than 260 hours per month were more vulnerable to CVI (OR = 31.8; 95%CI: 1.8 - 56.5).[25]

Seafood processing workers who regularly worked an average of more than 8 hours a day were 3.87 times more prone to CVI than those who worked 8 hours a day (95%CI: 2.14 -6.99; p <0.001). The results of our research were similar to a study of Dang H, et al., workers working more than 40 hours a month were more at risk of CVI (OR = 2.69; 95%CI: 1.18 - 6.11).[10] Therefore, a frequent working posture that requires standing or sitting combined with overtime work facilitated blood to rush to the legs, increasing pressure in the veins in the legs, and causing damage to the one-way venous valves. When the valves were weakened, they reduced their ability to prevent blood from flowing downward due to the effect of gravity, leading to blood stagnation in the legs and insufficiency of the venous valves.

Conclusions

CVI was a health problem for seafood processing workers. This disease had a high incidence rate, 1 in every 2 workers had CVI and most of them did not know they had CVI. Some factors related to CVI in seafood processing workers included gender, age, occupational age, continuous standing or sitting working posture, overweight and obesity, abdominal obesity, hypertension, diabetes, maternity history, and regularly working more than 8 hours per day. To prevent CVI, it is crucial to recommend workers exercise between shifts or breaks, control their weight; and have regular health check-ups to detect signs and symptoms of CVI.

Conflicts of interest

There are no conflicts of interest.

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